

GEORGIA INSTITUTE OF TECHNOLOGY  
OFFICE OF CONTRACT ADMINISTRATION  
SPONSORED PROJECT INITIATION

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no action  
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Date: May 3, 1979

Project Title: Comprehensive Parks and Recreation Plan for the City of Atlanta

Project No: D-48-633

*Green card*

Project Director: H. Randal Roark

Sponsor: National Endowment for the Arts

Agreement Period: From 5/1/79 Until 5/1/80

Type Agreement: Grant No. 92-4233-128

Amount: \$30,000 NEA Funds (D-48-633)  
30,000 City of Atlanta Contribution (D-48-316)  
\$60,000 Total

Reports Required: Financial Status Report; Final Descriptive Report; Reprints of any Product

Sponsor Contact Person (s):

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Defense Priority Rating: N/A

Assigned to: Architecture (School/Laboratory)

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Other \_\_\_\_\_

1618  
28-  
N-T

GEORGIA INSTITUTE OF TECHNOLOGY  
OFFICE OF CONTRACT ADMINISTRATION  
SPONSORED PROJECT TERMINATION

Date: May 4, 1981

Project Title: Comprehensive Parks and Recreation Plan for the City Of Atlanta

Project No: D-48-633

Project Director: H. Randal Roark

Sponsor: National Endowment for the Arts

Effective Termination Date: 8/1/80

Clearance of Accounting Charges: 8/1/80

Grant/Contract Closeout Actions Remaining:

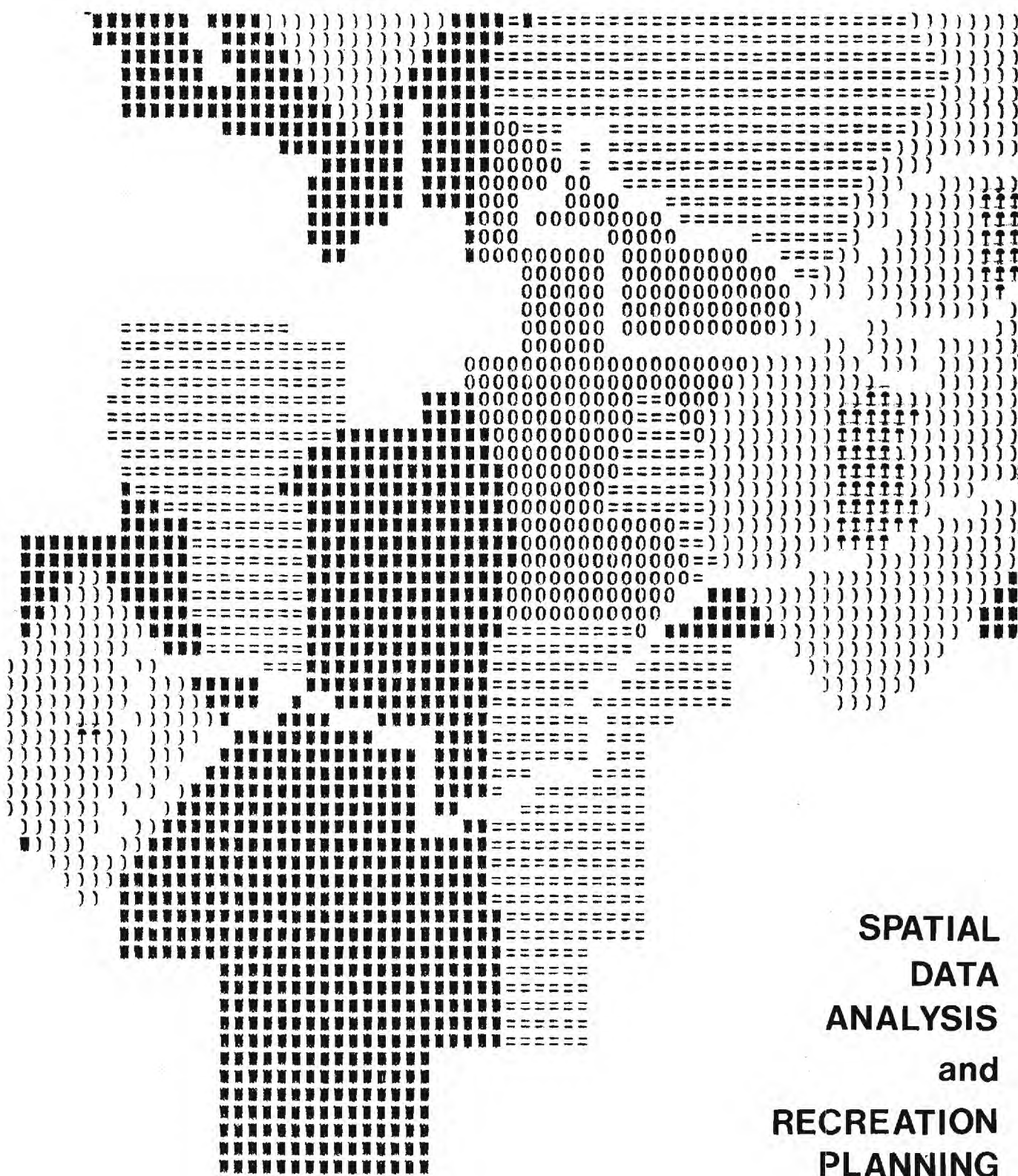
- ☐ Final Invoice and Closing Documents
- ☒ Final Fiscal Report
- ☐ Final Report of Inventions
- ☐ Govt. Property Inventory & Related Certificate
- ☐ Classified Material Certificate
- ☐ Other \_\_\_\_\_

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# SPATIAL DATA ANALYSIS and RECREATION PLANNING

## THE ATLANTA PROTOTYPE

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SPATIAL DATA ANALYSIS  
AND RECREATION PLANNING:

A Demonstration Study on an approach  
to urban recreation planning using the  
The City of Atlanta as a prototype

Prepared by

The College of Architecture  
Georgia Institute of Technology

August 1, 1980

Project Directors

H. Randal Roark, AIA, AICP  
Douglas C. Allen, ASLA

Principal Consultant

ERDAS, INC.  
Atlanta, Georgia

This study was funded by the National Endowment  
for the Arts under the Design Arts' "Livable  
Cities" Program. Matching funds were provided  
by the City of Atlanta; Department of Budget and  
Planning, Department of Parks and Recreation, and  
Atlanta Urban Design Commission.



## I NATURE OF THE PROJECT

This project was undertaken to explore innovative methods of comprehensive planning for parks and recreation systems in urban areas. The project was carried out by the College of Architecture of the Georgia Institute of Technology through a \$30,000 grant by the National Endowment for the Arts under the former "Livable Cities" program. Matching funds for the project were provided through in-kind contributions from the City of Atlanta, including the Department of Budget and Planning, the Department of Parks and Recreation, and the Atlanta Urban Design Commission.

The project has the support of the Heritage Conservation and Recreation Service (HCRS) arising from HCRS concern for providing better recreation planning and services in America's cities as expressed in the "National Urban Recreation Study" in 1977 and the subsequent Urban Parks and Recreation Recovery Act (UPARR), passed in 1978. The City of Atlanta Parks System provides the test case for the study and the base data used is that which is currently available, either through Atlanta's recently prepared UPARR "Five Year Action Plan and Program" or other ongoing planning functions.

It is the intent of the project to demonstrate the application of available and easy-to-use systematic planning methods to short-term decision making in the distribution and budgeting of cultural and recreation programs and facilities. The project addresses the use of these methods to parks and recreation systems in the general case, using the Atlanta system as a prototype. If successful, the use of such methods will have broader implications for urban planning in general where program and budget decisions must be made on a spatial basis.

The project was approved for funding in May, 1979, and was completed August 1, 1980.

## II THE HYPOTHESIS: RECREATION PLANNING AND SPATIAL DATA BASE

The application of grid-cell computer data base technology to recreation planning is not new. Both the technical computer methods and the recreation planning techniques used in this project have existed for at least a decade, if not more. The project's uniqueness stems from three questions asked at the outset. First, could an existing, easily transferable, computer program be combined with proven techniques of public participation and goal-oriented recreation planning? Second, could this be applied in an urban environment? Third, and perhaps most important, could all of this be done in a cost-effective way? Because of the inherent risk involved in an experimental project of this nature, it seemed reasonable to approach the National Endowment for the Arts with a proposal to conduct a study which would build such a computer data-base for a reasonably large city and to examine the viability of such an approach.

The use of computers to store, retrieve, and manipulate data is common practice in most cities and towns today. Typically, the types of data stored range from payroll, budget and similar financial data to tax records, census data, and crime statistics. Computer programs which can retrieve and display data in mapped form are in common use in many locations throughout the country. A particular advantage of this type of data storage and analysis is the recognition of how the data varies by location.

When this use of computers first began in the 1960's, it was applied to problems which required specific knowledge of the spatial characteristics of a given set of data. Originally, these applications were concerned with the location of such things as soil type, vegetation, flood hazard areas, and other similar geographic information. By the mid 1970's, these geographic data bases were being used to define such things as suitable sites for septic tanks, power transmission lines and sanitary landfills. By combining depth of water table, percolation rate, and steepness of slope, planners could identify sites which met the county or state health code. The advantage of a computer in this type of problem was simply its ability to analyze large amounts of data quickly and cheaply.

These efficiencies combined with the added spatial dimension of the data base allowed planners and health officials to examine the effect of changing the criteria for septic tank installation on the availability of land for development. Since the data was stored in the computer, a quick tabulation of the acreage affected by any proposed change in the health code could be provided. By combining this with land value, for example, an approximation of the effect on the tax base could be developed. Eventually, these techniques were improved upon and have been used by the U.S. Forest Service, the U.S. Army Corps of Engineers, and others to identify sites for outdoor recreation developments. By defining the most desirable characteristics of a good camp site, the data base could be analyzed to locate and rank, in order of attractiveness, the most desirable locations for campgrounds.

### III THE SPATIAL DATA ANALYSIS PROGRAM

The project seeks to examine the viability of spatial computer applications to park and recreation system planning in urban areas. Conceptually, the project was undertaken to explore innovative methods of planning for parks and recreation systems in large urban areas. Computer technologies which can store, retrieve, manipulate, and display data in a spatial format have been applied to several straightforward park and recreation planning and management problems which could conceivably face any recreation manager in any large city in the United States. Examples of these problems would include, but not necessarily be limited to the following:

1. Preparation of a statistical profile of the service population of a given park or recreation facility for a UPARR grant application.
2. Identification of the most efficient location for an instructional swimming program for disadvantaged youth.
3. Identification of the three best park facilities for the operation of a summer day camp crafts program.
4. Determination of the recreation facility having the least impact on the park system in the event that budget cutbacks require that one be closed.
5. Identification of special populations not currently served by the parks system.
6. Determination of the best site for the construction of a new facility.
7. Analysis of the public transportation system for its efficiency in serving park and recreation users.
8. Identification of the three best parks for the operations of an arts program.

Current, readily available computer technologies were tested for their ability to solve these problems. An interactive system consisting of three independent data bases, with a fourth "floating" data analysis capability, was chosen as the most flexible and efficient means of storing and manipulating existing demographic and parks data in both statistical and geographic spatial display formats. The following describes the system as designed and gives results of its ability to respond to three of the problems identified at the outset.<sup>1</sup>

#### Description of the System: The Data Base Approach

Three independent data bases were created for this project. Each consists of two parts. Part A is a file of demographic data. Part B is a geographic file of data collection zones and Neighborhood Planning Unit locations.<sup>2</sup> The geographic file allows the demographic data to be stored by its geographic location within the city. The second independent data base consists of a file of park and recreation "attributes" and a geographic file of park and school locations, similar to the geographic file of N.P.U. locations. The third data base contains transit lines and stations. Other public facilities such as fire stations or water lines could be added if desired. There is no inherent limit on the number of independent data bases created. These three independent data bases can be accessed by a "floating" Spatial Analysis Program consisting of "canned," interactive computer software and a color image processor. The Spatial Analysis Program has been modified to run on a micro-computer with a color television as a display unit. The Spatial Analysis Program allows data stored in any of the independent data bases to be retrieved, manipulated and displayed in mapped form. More importantly, the analysis program allows

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<sup>1</sup> It should be noted that the examples stated are by no means the only problems capable of being addressed by the system. These problems were chosen primarily for the variance in the levels of complexity of analytical procedure. Wider application of this system is discussed in Speculations on Further Development at the conclusion of this paper.

<sup>2</sup> These will be referred to as N.P.U.'s. The City of Atlanta began collecting data and developing neighborhood plans in 1974. The N.P.U. is simply the aggregate of neighborhoods in each planning unit. There are 26 N.P.U.'s in Atlanta, and 142 Neighborhood Data Collection Zones.

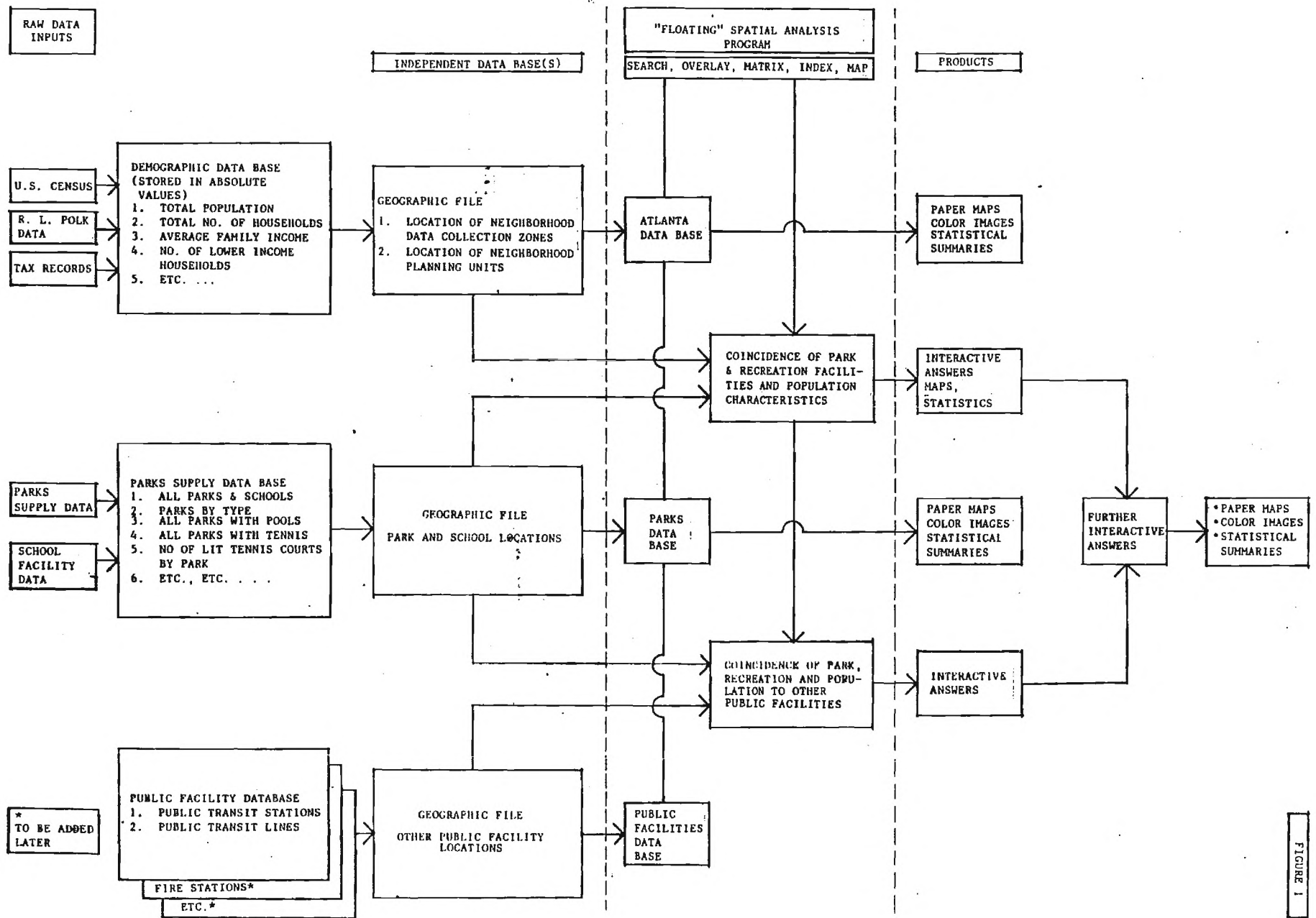


FIGURE 1



for either analysis of a single data variable as a discrete product, or for the analysis of that variable and any combination of variables within a second (parks attributes) data base. Four types of products are available to the user at the end of any specific analysis. These are black and white paper maps, color display on a television screen, and statistical summaries and cross-tabulations. Interactive answers to questions concerning the coincidence of any number of variables in both data bases in any of the three formats previously mentioned provides a fourth product. The structure of the spatial data base is outlined in Figure 1.

The Spatial Analysis Program "floats" between and among any or all of the data items stored in either the demographic data base, or the parks data base. Any individual data variable can be called into the Spatial Analysis Program and combined with any other data variable in either data base. This structure allows the absolute values in population or income, for example, to be stored independently and permanently. The analysis program can generate specific analysis of, say, income in even divisions up to 15 categories, plus or minus one or two standard deviations of the mean, or quartiles based on frequency of occurrence, or any other division specified by the user. The results of this analysis can be mapped, displayed on a television screen, or printed in statistical summary format. Most important, however, the results of this analysis can be combined with the results of any other analysis, such as the number of outdoor cooking grills located within neighborhood parks. This allows the recreation manager or planner to determine where the existing supply of any facility is located in relation to any population group or any other public facility. A listing of the variables in the demographic data base is shown in Figure 2. Figure 3 gives examples of parks attributes stored in the parks supply data base.

FIGURE 2

DEMOGRAPHIC DATA BASE

GEOGRAPHIC LOCATION FILE	DEMOGRAPHIC DATA (IN ABSOLUTE VALUES) <sup>3</sup>
1. Neighborhood Data Collection Zones (142 Zones)	1. Total Population By Neighborhoods (Values range from 12 to 7,002 persons/ neighborhood)
2. Neighborhood Planning Units	2. Total Households by Neighborhood (Values range from 10 to 3,792 households per neighborhood)
	3. Number of Households With Children by Neighborhood (Values range from 5 to 1,329)
	4. % Change in Households With Children by Neighborhood, 1970 to 1979 (Values range from -32.1% to +89.2%)
	5. % Change in All Households by Neighborhood (Values range from -13.2% to +55.7%)
	6. Number of Persons Under 18 Years by Neighborhood (Values range from 10 to 3,469)
	7. Number of Retired Heads of Household by Neighborhood (Values range from 3 to 941)
	8. Mean Family Income by Neighborhood (Values range from \$3,808 to \$28,300)
	9. Number of Lower Income Households by Neighborhood (Values range from 5 to 1,856)
	10. Race (not available for racial composition by neighborhood)

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<sup>3</sup> Demographic data was taken from R.L. Polk and Co., Databook for Population Characteristics, Atlanta, Georgia 1979, R. L. Polk and Co. Data from the 1980 U.S. Census would be preferable but was not available.

FIGURE 3

PARKS SUPPLY DATA BASE

PARKS LOCATION

1. Geographic Location by Latitude and Longitude
2. Location Within Parks and Schools Boundaries

PARKS ATTRIBUTES

1. Recreation Facility Identification
2. Number of Acres
3. Park Type - community, neighborhood, mini-park, regional nature preserve
4. Recreation Center - Class I through Class IV, Arts & Crafts, Community Center
5. Swimming Pool - inside, outside, outside with lights
6. Number of Baseball Fields  
Lights - Yes or No?
7. Number of Softball Fields  
Lights - Yes or No?
8. Number of Combination Fields  
Lights - Yes or No?
9. Number of Football Fields  
Lights - Yes or No?
10. Number of Freeplay Areas  
Lights - Yes or No?
11. Number of Outside Basketball Courts  
Lights - Yes or No?
12. Number of Handball Courts  
Lights - Yes or No?
13. Number of Tennis Courts  
Lights - Yes or No?
14. Number of Multi-Purpose Courts  
Lights - Yes or No?
15. Number of Parcours Courses  
Lights - Yes or No?
16. Golf Course - 9 or 18 hole course
17. Trails - bikes, nature, jogging
18. Number of Playgrounds
19. Number of Picnic Tables
20. Number of Grills
21. Number of Pavillions
22. Number of Amphitheatres
23. Parking Availability - sufficient, insufficient, not known
24. Number of Restrooms

## The Grid-Cell

The single most important aspect of any data base is its ability to respond to the questions asked of it at a cost that is less than that normally incurred in the decision-making process. There are two ways to ensure that this is accomplished. The first is to structure the data so that the actual cost in computer time is the lowest possible, and second, to gather only the data required for the type of decisions being made. The use of the grid-cell data structure is the most cost-effective means of handling spatial data. The storage of data by grid maximizes the efficiency of the computer since each grid is considered to be a single point of reference. Several programs, which store and map data in irregular polygons corresponding to the actual shape of the data item on the ground, have been developed in recent years and are in limited use in a variety of places. Since there is no common point of reference, however, the cost of manipulating more than one data set at any given time is relatively high.

Two considerations should be given to the selection of the size of the grid-cell. Since data within each grid is considered to be homogeneous, a cell size which is too large will not capture the information needed to make useful decisions. Likewise, one that is very small could become too costly since more time would be required to enter data and update it over time. For this project, a grid-cell of approximately five acres was chosen. This should be small enough to capture relevant data on population and land-use, and yet is not cost prohibitive.

## Data Collection and Spatial Encoding

Existing demographic, zonal and planimetric information is being used for the NEA Atlanta Parks System Study. This information was recorded in a spatial fashion to enable direct comparison and analysis of variables which normally exist only in tables or on maps of differing scales.

Spatial encoding of the data was done utilizing the 7 1/2 minute U.S.G.S. quadrangle maps as the base. A grid consisting of 90 rows and 90 columns was drawn for the specific latitude of the project area. The registration of the grid to the four corners of the 1:24,000 reference scale maps ensures the same

4.89 acre cell will cover the same area on the ground each and every time. The information is encoded using "predominance" criteria for the "area" variables such as Land Use, Public Recreation and Neighborhood Data Collection Areas; however, "presence" was sufficient to elicit a code for linear variables such as Mass Transit.

The data for the Atlanta Study was acquired mostly from the City's planning department. The land use data was available on large "foam-core mounted" maps, each map representing a different Neighborhood Planning Unit. Because of the differences in neighborhood size, the land use maps were at varying reference scales. For the demographic information of the city, a choice existed of either using outdated 1970 Census data or using "Polk" data collected in 1978 but available only at relatively coarse collection zones. Because of the changing complexion of the project area, the more recent "Polk" data was selected with the intention of refining much of the demographic information by using the residential elements of the Land Use variable. The corresponding zonal boundaries to the "Polk" data, Neighborhood Data Collection Areas, were encoded enabling use of a table look-up procedure for all "Polk" recorded information. The Public Recreation variable consisted of the locations of parks owned or managed by the City and the locations of facilities associated with the Atlanta Public Schools. Individual recreation facility IDs were spatially encoded for each facility allowing use of an ancillary file of recreational attributes. All of the recreational information was available from the City of Atlanta Planning Department as a result of the recent UPARR program.

The importance of using a recreational attribute file and a demographic "look-up" table both intimately connected to their corresponding spatial variables is in the ability to access a great deal of data by encoding only one variable, therefore lowering costs. Instead of needing to code one variable for population, one for location of elderly and still another for average family income, etc., all of these are available through use of the table look-up procedure and the spatially coded demographic zones. Perhaps just as important is the ability to maintain the acquired information in its original form. This allows the user/planner the option of categorizing the continuous information into a discrete form of his choosing: for example, population data can be divided into 10 equal intervals, or quartiles, or even user-specified intervals.



## The Spatial Analysis Program

The analytic portion of the Spatial Analysis Program is a canned program called IMGRID.<sup>4</sup> It has been substantially modified by ERDAS Inc. of Atlanta, Georgia, for use with a series of interactive, low-cost, mini and micro-computer systems. Its major advantages are its simplicity of use and its analytic flexibility. IMGRID operates from a keyword response, written in English. This is critical since the major users of this system, recreation managers, are not likely to have extensive computer training. Once in place, a person with no previous computer experience can be trained to perform basic analyses in one day. In three to five days, the same individual could perform analysis at least as complex as those given in this paper. Analysis is performed simply by specifying the variable number, or numbers, and activating one of the keywords. These include: Search, Matrix, Index, Overlay, Rescale, Map, Test and A Search. A brief description of the analytic capability of each keyword is given.

### 1. SEARCH

This tells the computer to search a specified distance from any given variable such as parks with swimming pools. The search can be from 500 feet to one and one-half miles from the location of any variable specified by the user.

### 2. MATRIX

This combines two independent variables and creates a third. For example, a simple matrix might be between age and income. Locations of households with children could be combined with income levels above and below the

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<sup>4</sup> IMGRID is an acronym for Information Management GRID. It was written by David Sinton, Department of Landscape Architecture, Graduate School of Design, Harvard University, in 1973, 1974. This program is in the public domain and is available from Harvard University. Substantial modification was performed by ERDAS Inc. of Atlanta, Georgia for use with a Data General Eclipse Mini-Computer and a Comtal Image Processer prior to this project, and was used extensively in the development of the Atlanta study. The original IMGRID program was also modified by ERDAS Inc. for use with a self-contained micro-computer system with floppy disc capability and display on a standard Sony color television.



mean. This would produce a third variable, with four categories of income and households with children.

### 3. INDEX

This combines any number of variables in a weighted index and assigns new values to the locations having the highest through the lowest values as specified by the user. Weights are determined by the user. For example, if income is twice as important as age, then a weight of 2 can be assigned to the category of income deemed important.

### 4. OVERLAY

This combines two or more independent variables by "overlaying" one on top of the other. The highest value in any location is retained.

### 5. RESCALE

This allows the user to rescale the values stored in the data base. (The data base is stored with a "nominal" scale which allows the user to access variables by calling out its number), RESCALE allows new numbers to be assigned to the nominal scale converting it to either an ordinal or an interval scale. RESCALE is used in conjunction with INDEX.

### 6. MAP

This simply tells the machine to make a map of any individual variable or combination of variables.

### 7. TEXT

This allows the user to write whatever is needed on the maps. A standard text format can be stored to save time.

## 8. A SEARCH <sup>5</sup>

This is potentially the most useful keyword in performing analysis of parks systems. The A SEARCH keyword initiates a search from any or all parks and records the population characteristic encountered within the search radius. It then sums those characteristics and re-assigns new values to all parks searched from. This produces a ranking of all parks based on the most (or least) specified characteristic encountered.

Keywords are displayed on a "television" display monitor and specified by simply typing the one desired on a terminal keyboard. By combining several keywords in a step-wise manner, several complex sets of analyses can be performed in an extraordinarily short period of time.

We have described this part of the system as a "floating" Spatial Analysis Program because it allows the user to move quickly between and among the independent data bases. The Spatial Analysis Program also has a data storage capability. Initially blank, the user can store new variables created during analysis in a "new" data base. This allows the original absolute values to remain in the independent data bases, and analysis of those values to be retained in the Spatial Analysis Program files. The system as currently designed can handle up to 30,000 separate analyses generated by keyword manipulation of the original data. By storing analysis results, the user does not have to re-create a new analysis each time the system is used. This amounts to a "pre-analysis" capability which allows different and conflicting criteria to be stored and compared simultaneously.

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<sup>5</sup> As of this writing, A SEARCH is not yet operable and is not shown in any of the examples. A SEARCH will be operable on the system as described by August 15, 1980.

IV APPLICATION TO URBAN RECREATION PLANNING AND MANAGEMENT:  
THE ATLANTA PROTOTYPE

At its simplest conceptual level, recreation planning is decision making which allocates fiscal resources among competing interests. Typically, in recreation, this involves making hard choices among a variety of alternative recreation facility developments. Examples of such choices might include:

Do we build one tennis court and two ballfields, or one ballfield and four tennis courts?

Do we develop a new facility or redevelop an existing one?

Do we increase the program staff at a community center or add a basketball court?

These choices are normally made through the political process. No data base will ever be a substitute for the need for human political decision-making. Likewise, the recreation planning tool discussed in this paper cannot provide answers to questions of choice among competing interests. Only elected officials and public administrators are capable of making these decisions. This project does seek to provide these decision-makers with information in a structure which can be extremely helpful in that decision-making process. Through the use and cost effectiveness of the computer and the structured, spatial format of the data, a variety of alternatives can be quickly and cheaply evaluated for any given set of criteria, goals, or objectives.

There are other aspects of recreation planning and management which do lie outside the political process, however. Professional judgments by informed recreation planners and program managers are required for the operation of any successful parks system. As such, the system described in this paper is intended for use on a day-to-day, operational basis by recreation program managers. Several example problems common to Atlanta's Park System were tested through this planning tool. The following is a description of these tests:

Problem No. 1: 6

The City of Atlanta wishes to establish an instructional swimming program for disadvantaged youth. Which existing swimming pools have the greatest number of low income youth (under 18 years) within a one mile radius?

- Solution:
1. Access demographic data base, divide income into 4 divisions (quartiles) specified by the user.
  2. Access demographic data base, divide number of children less than 18 years into 3 groups..
  3. MATRIX income by quartile with children less than 18 years.

		Income in Dollars			
		0-8,000	8-15,000	15-22,000	22-28,000
Age (Number of children under 18)	< 1000	1	2	3	4
	1001 - 2000	5	6	7	8
	> 2000	9	10	11	12

The product of this analysis is a map showing the 12 categories of income and age, and a statistical summary of the frequency of occurrence of each. Category 9 in the matrix is the highest concentration of low income children. Store the results of this analysis in the Spatial Analysis Program file.

4. Access parks attributes file for all parks with swimming pools.
5. SEARCH from all swimming pools one mile.
6. OVERLAY the search from all swimming pools with the analysis generated by Step 3.
7. Identify the pool having the highest concentration of disadvantaged youth within a one-mile radius.

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<sup>6</sup> Due to space limitations, the graphic products of Problem No. 1 and No. 2 are not shown.

Problem 2:

The City of Atlanta wants to run a summer day camp featuring swimming instruction in the morning hours and an arts and crafts program for the same children in the afternoon. There is enough money in the budget to staff three camps. Swimming instruction requires a pool and the arts and crafts program requires at least two picnic pavilions. Where are the parks containing more than two picnic pavilions and a swimming pool?

- Solution:
1. Access parks attributes file for pavilions.
  2. RESCALE all parks having less than two picnic pavilions. This creates a new file of parks having two or more pavilions.
  3. MATRIX parks with >2 picnic pavilions and (from parks attributes file) all parks with swimming pools.
  4. The product is a MAP of all parks having both swimming pool and more than two pavilions.
  5. Store this temporarily in the Spatial Analysis Program file.

The program director of the day camp wishes to locate the program so that low income youth without access to transportation could easily walk to the camp.

- Solution:
1. SEARCH one mile from all parks identified as having pool and more than two pavilions.
  2. Recall the matrix of age and income stored in the Spatial Analysis Program file (from Problem 1).
  3. OVERLAY the search from parks with more than 2 pavilions and pool with the matrix of age and income.
  4. MAP the results. Visually identify the highest concentrations of low income children within one mile of parks meeting day camp criteria.

- (Optional)
5. A SEARCH from all parks meeting the specified criteria. Sum the total number of low income children within the search radius and rank all parks in order of the largest number served. (This option would eliminate Steps 3 and 4).

Problem No. 3:

The City of Atlanta has identified a need for two additional swimming pools. The FY 1981 capital improvement budget has enough money for one additional swimming pool. The Bureau of Parks wants to locate the additional pool in an existing community park which will serve the most households with children. Which park should the city choose for the additional pool?

Solution: 1. Access demographic data base for households with children. Divide into four categories:

- A. Less than 1 standard dev. from mean
- B. Within 1 standard dev. from mean (-)
- C. Within 1 standard dev. from mean (+)
- D. Greater than 1 standard dev. from mean

Store in Spatial Analysis file. MAP (Figure 4)

- 2. SEARCH from all pools (one mile search)
- 3. OVERLAY search from pools and households with children. Eliminate all households within one mile of existing pools. MAP unserved households with children. (Figure 5)
- 4. OVERLAY existing community parks without pools with population not served (from previous step). MAP analysis of existing community parks for most children served. (Figure 6)
- 5. Identify existing community park serving most children. Add to swimming pools file in Spatial Analysis Program files. (The computer now treats the identified park as though it had a swimming pool). MAP as population left unserved by new pool.
- 6. Access public facilities data base for frequent transit service.
- 7. OVERLAY transit lines with remaining unserved population. Identify potential new transit service areas to link unserved population with swimming pools. (Figure 7)



## V THE MODEL AND UPARR

### The UPARR Program

On March 27, 1978, the President, in his policy message to Congress, proposed a new federal grant program for urban communities to rebuild parks and recreation facilities. Subsequently, on October 13 of that same year, Congress passed the National Parks and Recreation Act of 1978 (P.L. 95-825). This law and its accompanying program, known as Urban Parks and Recreation Recovery (UPARR), had a stated two-part goal of providing economic aid to financially troubled cities and encouraging local governmental planning "for the long-range improvement of their parks and recreation systems." This act requires that eligible cities and counties develop a Recreation Recovery Action Program. This requirement is a means by which communities can develop "a continuous planning process," and a specific Five Year Action Plan.<sup>7</sup>

### The Five Year Action Plan

The federal rules and regulations are quite specific about the process and components of the Five Year Plan. At the heart of the process is a comprehensive assessment of the deficiencies and needs of the existing park system and a discussion of the major issues which it faces. Such assessment not only includes an inventory of all recreation facilities, public and private, used by the city's population, and the condition of these facilities, but it requires an in-depth analysis of the extent to which these facilities efficiently and equitably serve all segments of the population, with special emphasis on minorities, elderly, handicapped, youth, etc. Also included is an assessment of how well existing recreation and cultural programs serve the needs of the population. Such complex interrelationships involve the collection of a great volume of data just to understand problems with the existing parks system. More often than not, the collection of such data for cities with a population

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<sup>7</sup> Federal Register, Vol. 45, No. 48, Monday, March 10, 1980. "Rules and Regulations of the Urban Park and Recreation Recovery Act of 1978, Local Recovery Action Program."

of 50,000 or above is more efficiently handled by simple computer tabulation and statistical analysis. Most cities of this size have an in-house computer capacity that can be simply programmed for this purpose. The addition of the spatial data base described in this study would clearly enhance the jurisdiction's capability to handle and display this data and, in most cases, would involve the addition of relatively inexpensive visual display and/or printing hardware.

The assessment of deficiencies is more difficult, however, since it involves some measure of existing and projected recreation demand against which to measure the adequacy of existing services and facilities, i.e., if a city has a demand in the next five years for ten swimming pools and has six now in use, then it has a deficiency of four pools. If however, those six pools are located so that they do not equitably serve the existing population, or are in poor condition, then issues of rehabilitation and distribution compound the problem.

The use of the Spatial Analysis Program is particularly well suited to address such questions of distribution, allowing assessment of the adequacy of existing distribution of facilities or a test of the adequacy of any number of proposed facilities through a rudimentary "simulation" process. Such simulation allows the evaluation of any proposed facility in terms of a given set of criteria and therefore, comparison of proposed facilities to select the one that best meets those criteria. This is well suited to the UPARR regulations where justification of proposed new or rehabilitated facilities are required on both service and budgetary grounds.

#### Continuous Planning Process

While the model is useful in the preparation of the specific five year plan, its greater utility lies with its effectiveness on a day-to-day ongoing basis, which is likewise an important requirement of UPARR.

While precise definition of "continuous planning" remains somewhat unclear, we believe that the system described in this paper can provide parks and recreation planners and managers with the means to conduct planning on a truly continuous basis. The advantages of the computer lie in its ability to store and recall

enormous quantities of data quickly and cheaply. The Spatial Analysis Program allows that data to be manipulated via simple "keyword" commands. Results of analysis performed by a user can be displayed in two different graphic forms as well as statistical summary tables. Once the system is in place, literally thousands of alternative program decisions can be evaluated in a period of two or three weeks. This could allow for increasingly meaningful public participation by allowing the planner an opportunity to quickly show a constituency the effect of their concerns on the parks system as whole. More importantly, perhaps, it provides a necessary link between planning and budget decisions.

## VI CONCLUSIONS

The intent of this study has been to apply readily available and inexpensive computer technology to the problems of urban parks and recreation planning, particularly with respect to the recent Urban Parks and Recreation Recovery Act (UPARR). The study has sought to demonstrate the use of such technology using the City of Atlanta as a prototype.

It has been clear, through work in the City of Atlanta and other independent work by the project team on Parks and Recreation Systems of cities of varying sizes, that the demographic and spatial data necessary to make such a planning tool effective exists in various forms in most cities. Most of this data is required, in fact, in the preparation of a Five Year Recovery Action Plan under the UPARR legislation. The IMGRID program is likewise available in the public domain, through the Department of Landscape Architecture at Harvard University.

The principal consultant in this study, Earth Resources Data Analysis Systems, Inc. (ERDAS), of Atlanta, Georgia, has made available to the project team previously developed additional program capability which was suitable for application to this project.

The Bureau of Planning and the Parks and Recreation Department of the City of Atlanta have had a full presentation of the study results and are considering the use of the program capability on a day-to-day basis. In addition to this study report, they have been delivered product maps of some of the inventory and analysis variables in two forms: first, black and white maps of each variable printed in shades of grey, and second, slides of selected variables taken from a color television screen.

Presentation of study results have also been made to officials of two other cities as well as to representatives of the Heritage Conservation and Recreation Service (HCERS), the federal agency responsible for administering the UPARR program. In addition, presentations of study results have been made to the National League of Cities Conference on Urban Recreation in San Antonio in March of 1980 and to a National Recreation and Parks Association Conference on Computers

in Recreation in St. Louis in July of 1980.

Based on the results in Atlanta and from these other presentations, the Spatial Analysis Program as an ongoing planning tool should have broad application to both urban recreation and other urban problems of a spatial nature. This study should be viewed as a status report on the development of a system for making urban problem solving cheaper, faster, and easier. In that respect, it contributes to the notion of "Livable Cities" in the broadest sense of the term.

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## SWIMMING POOLS

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9=OTHER  
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YAM, J. H. *PRODUCTION AND TISSUE*

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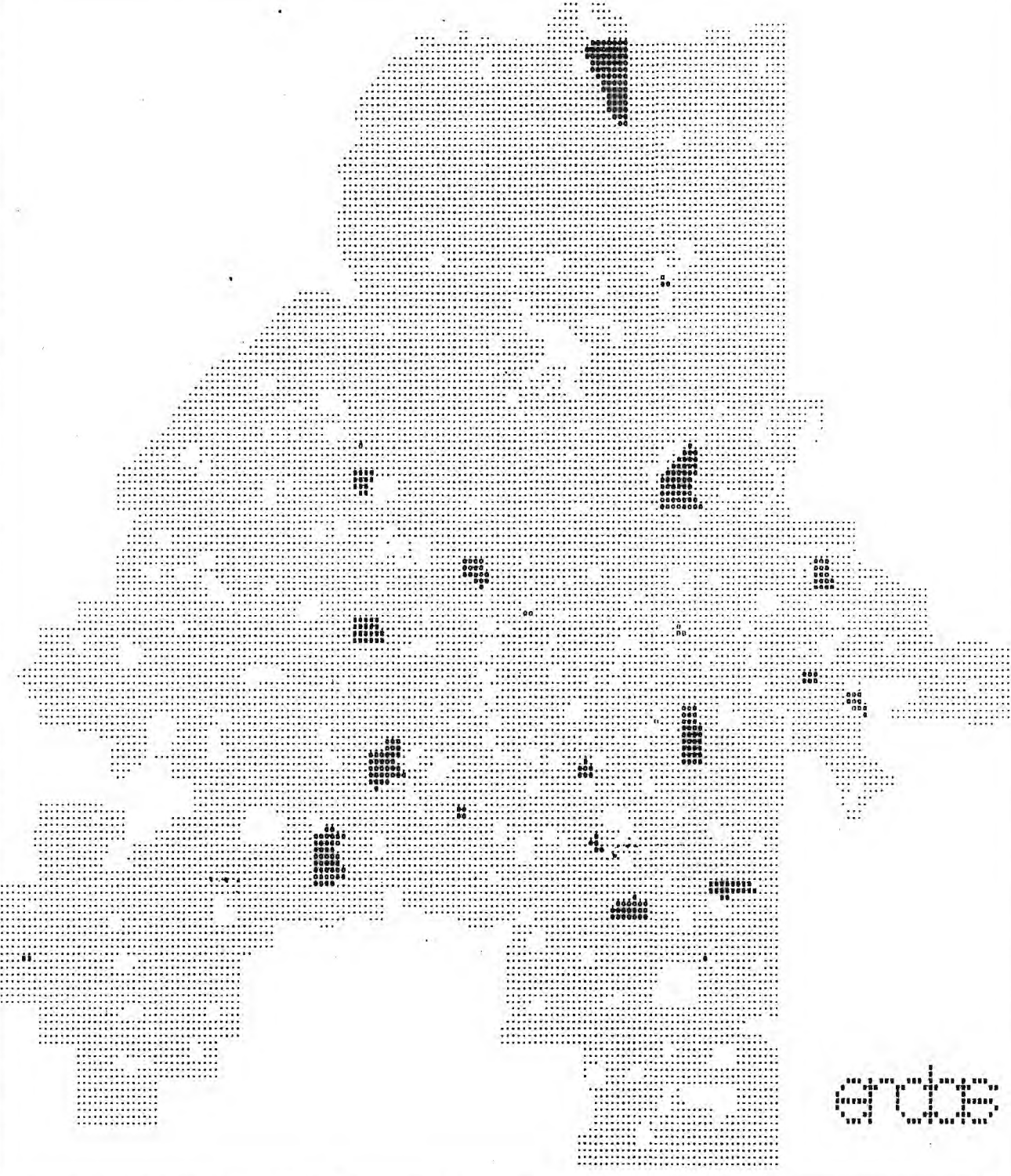
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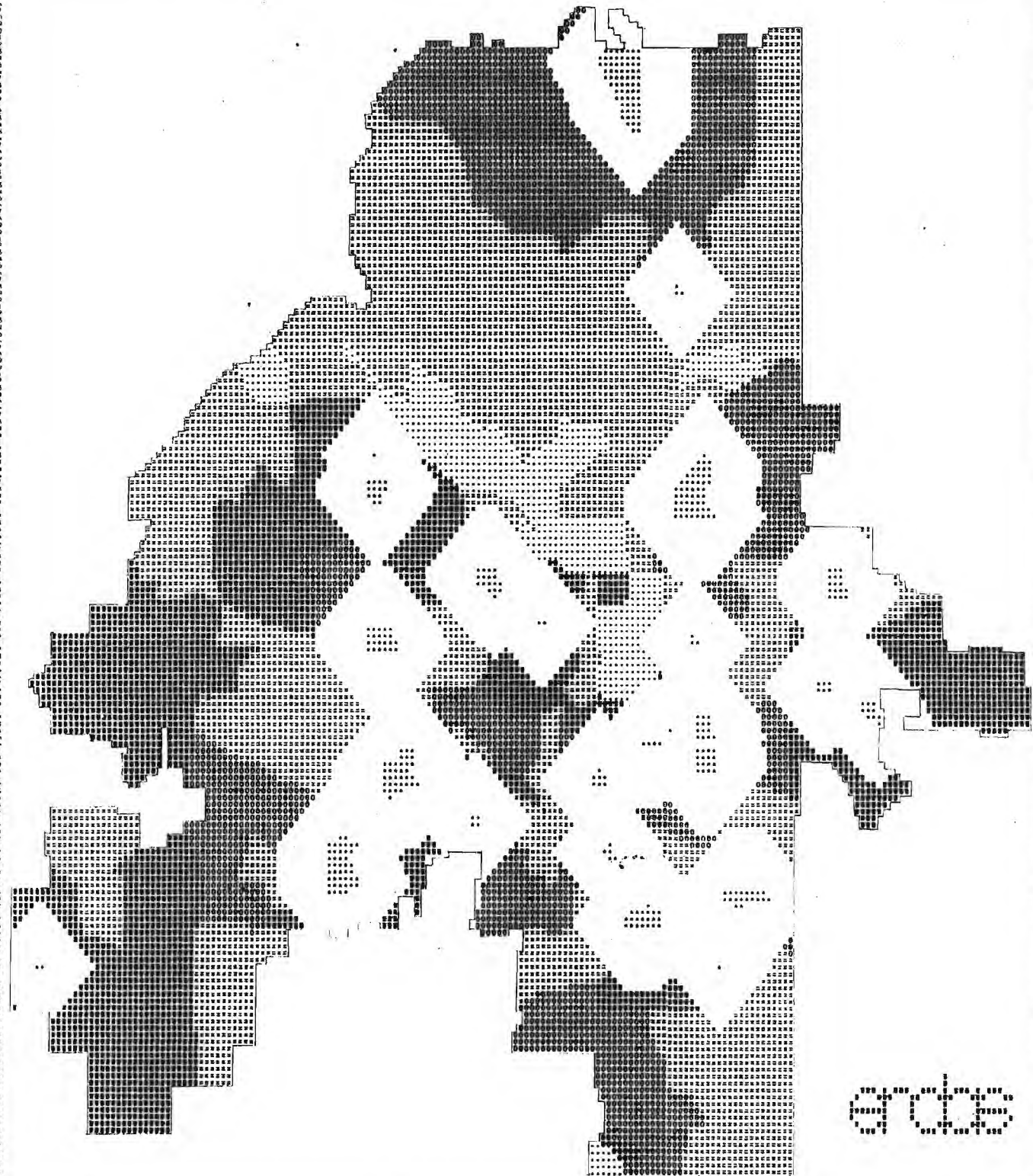
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MAR 86 HOUSEHOLDS WITH CHILDREN 4TH YRS OLD (+/- 30FY.)

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VAR\_50 HOUSEHOLDS WITH CHILDREN OUTSIDE 1 MILITARY SERVICE WANTING UPDATED POOLS

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VAR.51 RELATIONSHIP OF MOST FREQUENT BUS SERVICE AND PARKS WITH POOLS

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Appendix A

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Appendix B  
VARIABLES LIST



NATIONAL ENDOWMENT FOR THE ARTS  
ATLANTA PARKS SYSTEM PLAN

EARTH RESOURCES DATA ANALYSIS SYSTEMS  
999 MCMILLAN STREET, N.W.  
ATLANTA, GEORGIA U.S.A. 30318  
404 872-7327

# ATLANTA PARKS SYSTEM PLAN

## LIST OF DATA VARIABLES

AR.01 BACKGROUND MASK FOR CITY  
 AR.02 SELECTED PARK - PIEDMONT PARK  
 AR.03 PARKS ONLY (WITH MASK)  
 AR.04 PARK TYPE  
 AR.05 SELECTED PARKS (WITH MASK)  
 AR.06 SEARCH FROM CHASTAIN PARK  
 AR.10 RECREATION CENTERS  
 AR.11 SWIMMING POOLS  
 AR.12 BASEBALL FIELDS  
 AR.13 # TENNIS COURTS  
 AR.14 TENNIS COURTS WITH LIGHTS  
 AR.16 PARK TYPE (WITHOUT MASK)  
 AR.17 SEARCH FROM PARKS & SCHOOLS  
 AR.18 ANALYSIS - RESIDENTIAL LAND USE NOT SERVED BY PARKS  
 AR.20 TRANSIT  
 AR.21 LAND USE  
 AR.22 SEARCH - FROM PARKS AND SCHOOLS  
 AR.23 SEARCH - AREAS OUTSIDE SEARCH IN VAR #22  
 AR.24 SEARCH FROM SWIMMING POOLS  
 AR.25 INCOME QUANTILES  
 AR.26 INCOME QUANTILES WITHIN SEARCH FROM POOLS  
 AR.27 INCOME BY QUANTILE WITHIN ONE MILE OF SWIMMING POOLS  
 AR.28 POPULATION <18 YRS OLD  
 AR.29 TOTAL POPULATION (+/- SDEV)  
 AR.30 POPULATION DENSITY (5 EQUAL INTERVALS)  
 AR.31 POPULATION DENSITY (+/-SDEV)  
 AR.32 HOUSEHOLDS WITH CHILDREN (1 OR MORE PRES.)(PLUS OR MINUS ONE S.D.)  
 AR.34 % CHANGE PER 1000 HOUSEHOLDS - H.H. WITH CHILDREN  
 AR.35 # OF RETIRED HEADS OF HOUSEHOLDS  
 AR.38 # OF OUTDOOR GRILLES  
 AR.40 POOLS WITH MASK  
 AR.41 NUMBER OF PAVILLIONS  
 AR.42 PARKS CONTAINING 2 OR MORE PICNIC PAVILLIONS AND A POOL  
 AR.43 MATRIX OF AGE AND INCOME QUANTILES  
 AR.44 SEARCH FROM VAR.42 - ONE MILE PEDESTRIAN SERVICE RADIUS  
 AR.45 OVERLAY OF SEARCH FROM PARKS AND MATRIX IN #43  
 AR.46 HOUSEHOLDS WITH CHILDREN <18 YRS.OLD (+/- SDEV.)  
 AR.47 HOUSEHOLDS WITH CHILDREN OUTSIDE 1 MILE SERVICE RADIUS OF POOLS  
 AR.48 ANALYSIS OF COMMUNITY PARKS FOR MOST CHILDREN SERVED  
 AR.49 SEARCH FROM NEW PARK WITH POOL  
 AR.50 HOUSEHOLDS WITH CHILDREN OUTSIDE 1 MILE SERVICE RADIUS OF UPDATED POOLS  
 AR.51 RELATIONSHIP OF MOST FREQUENT BUS SERVICE AND PARKS WITH POOLS

# ATLANTA PARKS SYSTEM PLAN

## AR.01 BACKGROUND MASK FOR CITY

1=STUDY AREA  
15=OUTSIDE CITY

## AR.02 SELECTED PARK - PIEDMONT PARK

1=PIEDMONT PARK

## AR.03 PARKS ONLY (WITH MASK)

1=BG  
2=NOT CLASSIFIED  
3=NATURE PRESERVES  
4=MINI PARK  
5=NEIGHBORHOOD PARK  
6=COMMUNITY PARK  
7=REGIONAL PARK

## AR.4 PARK TYPE

0 = NOT CLASSIFIED  
1 = NATURE PRESERVE  
2 = MINI PARK  
3 = NEIGHBORHOOD PARK  
4 = COMMUNITY PARK  
5 = REGIONAL PARK  
6 = PUBLIC SCHOOL - ELEMENTARY  
7 = PUBLIC SCHOOL - MIDDLE  
8 = PUBLIC SCHOOL - HIGH

## AR.05 SELECTED PARKS (WITH MASK)

1=MASK OF CITY  
2=PIEDMONT PARK

## AR.06 SEARCH FROM CHASTAIN PARK

14=CHASTAIN PARK  
0 THRU 13 = SEARCH RADII

## AR.10 RECREATION CENTERS

0 = NOT CLASSIFIED  
1 = CLASS I  
2 = CLASS II  
3 = CLASS III  
4 = CLASS IV  
5 = ARTS & CRAFTS CENTER  
6 = NATURE CENTER  
7 = AHA COMMUNITY CENTER

## ATLANTA PARKS SYSTEM PLAN

## AR.11 SWIMMING POOLS

1=INDOOR  
 2=OUTDOOR  
 3=OUTDOOR WITH LIGHTS  
 9=OTHER  
 15=BACKGROUND

## AR.12 BASEBALL FIELDS

1=1 FIELD  
 2=2 FIELDS  
 3=3 FIELDS

## AR.13 # TENNIS COURTS

# COURTS IN ANY PARK OR AT ANY SCHOOL  
 IF MORE THAN 14 COURTS; WILL ONLY DISPLAY 14

## AR.14 TENNIS COURTS WITH LIGHTS

1=COURTS WITH LIGHTING  
 15=BACKGROUND (NO MASK)

## AR.16 PARK TYPE (WITHOUT MASK)

0 = NOT CLASSIFIED  
 1 = NATURE PRESERVE  
 2 = MINI PARK  
 3 = NEIGHBORHOOD PARK  
 4 = COMMUNITY PARK  
 5 = REGIONAL PARK  
 6 = PUBLIC SCHOOL - ELEMENTARY  
 7 = PUBLIC SCHOOL - MIDDLE  
 8 = PUBLIC SCHOOL - HIGH

## AR.17 SEARCH FROM PARKS &amp; SCHOOLS

0=ADJACENT CELLS  
 1=2 CELLS AWAY  
 2=3 CELLS AWAY  
 ETC  
 14=SUBJECT SEARCHED FROM E.G. PARKS & SCHOOLS

## AR.18 ANALYSIS - RESIDENTIAL LAND USE NOT SEARVED BY PARKS

## AR.20 TRANSIT

0 = NO SERVICE  
 1 = INFREQUENT SERVICE  
 2 = COMMUTER HOURS ONLY  
 3 = FREQ. SERVICE - WEEKDAYS ONLY  
 4 = FREQ. SERVICE - WEEKDAYS & WEEKENDS  
 5 = FREQ. SERVICE - WEEKDAYS & WEEKDAY EVENINGS  
 6 = FREQ. SERVICE - WEEKDAYS, WEEKDAY EVENINGS & SATURDAY  
 7 = FREQ. SERVICE - WEEKDAYS, WEEKDAY EVENINGS, SAT. & SUN.  
 8 = FREQ. SERVICE - WEEKDAYS, WEEKDAY EVENINGS, WEEKENDS & WEEKEND EVENINGS  
 9 = RAIL STATIONS

NATIONAL ENVIRONMENTAL POLICY ACT  
ATLANTA PARKS SYSTEM PLAN

VAR.21 LAND USE

0=VACANT	5=9-16 UNITS/ACRE
1=PARKS & SCHOOLS	6=5-8 UNITS/ACRE
2=INSTITUTIONAL	7=00-4 UNITS/ACRE
3=PRIVATE RECREATION	8=COMMERCIAL
4=17+ UNITS/ACRE	9=INDUSTRIAL

VAR.22 SEARCH - FROM PARKS AND SCHOOLS

VAR.23 SEARCH - AREAS OUTSIDE SEARCH IN VAR #22

VAR.24 SEARCH FROM SWIMMING POOLS

1= ONE MILE RADIUS FROM POOLS  
14= POOLS  
15= BG.

VAR.25 INCOME QUARTILES

1=LOWEST INCOME QUARTILE  
2=2ND QUARTILE  
3=3RD QUARTILE  
4= HIGHEST INCOME QUARTILE

VAR.26 INCOME QUARTILES WITHIN SEARCH FROM POOLS

1= LOWEST INCOME QUARTILE  
2= 2ND QUARTILE  
3= 3RD QUARTILE  
4= HIGHEST INCOME QUARTILE

VAR.27 INCOME BY QUARTILE WITHIN ONE MILE OF SWIMMING POOLS

1 THRU 4 SAME AS VAR#25

VAR.28 POPULATION <18 YRS OLD

1= 1 TO 1000  
2= 1000 TO 2000  
3= >2000

VAR.29 TOTAL POPULATION (+/- SDEV)

1= 30 - 916  
2= 927 - 2728  
3=2729 - 4529  
4=4530 - 7309

## ATLANTA PARKS SYSTEM PLAN

## AR.30 POPULATION DENSITY (5 EQUAL INTERVALS)

1= 130-747  
2= 748-2808  
3= 4788-7116  
4= 7117-9445  
5= 9446-11773

## AR.31 POPULATION DENSITY (+/-SDEV)

1= 130 - 747  
2= 748 -2808  
3=2809 - 4858  
4=4859 - 11773

## AR.32 HOUSEHOLDS WITH CHILDREN (1 OR MORE PRES.)(PLUS OR MINUS ONE S.D.)

1= 5 - 78  
2= 79 - 393  
3=394 - 697  
4=698 - 1329

## AR.34 % CHANGE PER 1000 HOUSEHOLDS - H.H. WITH CHILDREN

1=-321 TO -150  
2=-149 TO 0  
3= 0 TO 150  
4= 150 TO 571

## AR.35 # OF RETIRED HEADS OF HOUSEHOLDS

1= 3-237  
2=238-472  
3=473-707  
4=708-948

## AR.38 # OF OUTDOOR GRILLES

1=MASK OF THE CITY  
2 THRU 14 = # OF GRILLES  
15=BG

## AR.40 POOLS WITH MASK

1=MASK  
2=INDOOR POOLS  
3=OUTDOOR POOLS  
4=OUT.POOLS WITH LITES  
15=OTHER PARKS AND SCHOOLS



ATLANTA PARKS SYSTEM PLAN

VAR.41 NUMBER OF PAVILLIONS

1-8 = NUMBER OF PAVILLIONS  
14= OTHER PARKS AND SCHOOLS  
15= BG.

VAR.42 PARKS CONTAINING 2 OR MORE PICNIC PAVILLIONS AND A POOL

VAR.43 MATRIX OF AGE AND INCOME QUANTILES

1=LOWEST INCOME, <1000 CHILD.	7=MODERATE INCOME, 1000-2000 CHILD.
2=LOW INCOME, <1000 CHILD.	8=HIGH INCOME, 1000-2000 CHILD.
3=MODERATE INCOME, <1000 CHILD.	9=LOWEST INCOME, >2000 CHILD.
4=HIGH INCOME, <1000 CHILD.	10=LOW INCOME, >2000 CHILD.
5=LOWEST INCOME, 1000-2000 CHILD.	11=MODERATE INCOME, >2000 CHILD.
6=LOW INCOME, 1000-2000 CHILD.	12=HIGH INCOME, >2000 CHILD.

VAR.44 SEARCH FROM VAR.42 - ONE MILE PEDESTRIAN SERVICE RADIUS

1= ONE MILE RADIUS  
14= PARKS

VAR.45 OVERLAY OF SEARCH FROM PARKS AND MATRIX IN #43

14=PARKS  
2-13=MATRIX VALUES

VAR.46 HOUSEHOLDS WITH CHILDREN <18 YRS.OLD (+/- SDEV.)

1= 5-78  
2= 79-393  
3= 394-697  
4= 698-1329

VAR.47 HOUSEHOLDS WITH CHILDREN OUTSIDE 1 MILE SERVICE RADIUS OF POOLS

2= 5-78  
3= 79-393  
4= 394-697  
5= 698-1329  
10= MASK  
14= PARKS WITH POOLS

VAR.48 ANALYSIS OF COMMUNITY PARKS FOR MOST CHILDREN SERVED

SAME AS VARIABLE #47

## ATLANTA PARKS SYSTEM PLAN

AR.49 SEARCH FROM NEW PARK WITH POOL

1=MASK OF CITY  
2=1 MILE SEARCH RADIUS  
14=NEW PARK WITH POOL

AR.50 HOUSEHOLDS WITH CHILDREN OUTSIDE 1 MILE SERVICE RADIUS OF UPDATED POOLS

AR.51 RELATIONSHIP OF MOST FREQUENT BUS SERVICE AND PARKS WITH POOLS